

~~SECRET~~Reference No.
X 552434
20 December 1955

Chief, Operations & Training Division, OC

Chief, Engineering Division, OC

Transistorized Converter, CV-1

- REF : (a) Memorandum from OC-E to OC-O&T, X55-2236, dated 20 October 1955
 (b) Memorandum from OC-O&T to OC-E dated 6 September 1955
 (c) EUCA 55-894 dated 9 August 1955

1. In accordance with arrangements related to the above referenced correspondence, the Research & Development Laboratory will produce twelve transistorized converter units. The three units scheduled for December delivery are attached. Nine additional units will be forwarded on or before 23 January 1956.

2. With the exception of the provision for a tuning tool, all units will have been modified to include the features set forth in paragraph 3(a-e) of reference (a). A knob has been provided for the trimmer which eliminates the need for a detachable tool.

3. Additional testing of the prototype revealed that the sensitivity of the unit could be increased by improving the efficiency of converter-to-receiver coupling. It also had been noted that optimum operation of the prototype unit was strongly dependent upon the existence of a good ground. The input circuit has been modified to reduce this dependence. Components eliminated by these changes, the modifications effected by reference (a), and recent subminiature procurement have made possible a considerable reduction in the size of the unit. It now measures 3/4" x 1 3/16" x 3 3/8" instead of 3/4" x 2" x 5 3/8" as was representative of the prototype. The attached schematics and operating instructions have been modified to conform to the new units.

4. Photographs for insertion in the operating instructions, and spare batteries for the converter units, are not available at this time. Six additional sets of operating instructions, with photographs, and twelve spare batteries will accompany the remaining nine units in January.

DOCUMENT NO. _____
 NO CHANGE IN CLASS. ☐
☐ DECLASSIFIED
 CLASS. CHANGED TO: TS S **2010**
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 AUTH: **MR 70-2**
 DATE: **3 1960** REVIEWER: **06454**

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Attachments:

- | | |
|---|--------------------------|
| 1. Transistorized Converters, CV-1 (3) | Distribution: |
| 2. Adapters for flashlight cells (3) | Orig. & 1 - Addressee |
| 3. Operating Instructions (Converter) (3) | 1 - R&D Lab 1 - R&D/EP✓ |
| 4. Schematics (Converter) (3) | 1 - R&D Chrono 1 - Dev/s |
| | 1 - OC-E " |

R&D/Lab/NCP/jcm (20 December 1955)

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OPERATING NOTES AND INSTRUCTIONS
for the
CV-1 TRANSISTORIZED CONVERTER

I. INTRODUCTION

1. The operating notes and instructions contained herein have been revised to reflect the modifications incorporated as a result of prototype evaluation. This set of notes and instructions will supersede attachment #2 of OC-E memorandum X 55-2236 to OC-Q&T of 20 October 1955.
2. The subject converter is intended for use in conjunction with a standard broadcast receiver to enable the user to receive signals in the range of 3.0 to 6.0 mc. The output is broadly tuned to approximately 1500 kc. Except for the crystal, the unit is self-contained and self-powered by an internal battery. The crystal, which determines the signal frequency, plugs into a socket on the top face of the converter. The crystal holder actuates the on-off switch. The battery is a 1.34 volt Mallory type RM-401R capable of powering the unit for well over 2000 hours of operation. The battery voltage is not critical; batteries in the range of 1.0 to 3.0 volts may be used. An adapter is provided for each unit that will permit the use of standard flash-light cells. Other locally available batteries, in the above voltage range, may be used if proper polarity is observed. If the battery polarity is reversed the transistors will be destroyed.

II. CHARACTERISTICS

1. Physical

The unit dimensions are $3/4"$ x $1\ 13/16"$ x $3\ 3/8"$ and it weighs approximately five ounces. The battery compartment is so arranged as to permit the battery to be changed without opening the case. A recessed antenna-ground terminal block is provided for the converter antenna input connections. The permanently attached shielded cable connects the converter to the broadcast receiver. A combination crystal socket and on-off switch is accessible through a recess port in the top face. Only one tuning control is required for operation; a knob has been provided for this control and it also is accessible through the top face. The battery retainer plug has a wide slot for use with a coin or similar object. No tools are required.

2. Electrical

2.1. Sensitivity

The sensitivity of the unit is best indicated by the result of the following measurement. The signal level across the primary of the audio output transformer of a typical broadcast receiver was monitored with a Simpson Model 260 multimeter. The output was adjusted to 10 volts; a level safely above that of noise alone but still well below AVC operation. For this output level 400 microvolts were required at the signal generator output. Insertion of the converter between the signal generator and the broadcast receiver reduced the required signal generator output level to 4 microvolts for the same 10 volt level at the broadcast receiver output. Thus the indicated gain across the converter is 100. Since the relative magnitude of receiver and converter input impedance was not determined, this measurement does not reveal the true gain or sensitivity of the converter alone. It is interesting to note that the gain indicated by the same measurement on the prototype unit was only 58. The daylight broadcasts of a Toronto station, and the night operation of Radio Moscow, have been successfully monitored during bench tests. These stations were operating in the vicinity of 6 mc. A Philco broadcast receiver of 1938 manufacture was used at low volume settings for the tests. An external antenna was used.

2.2. Converter Tuning

The output circuit of the converters has been tuned to 1500 kc. The response of this circuit is relatively broad; laboratory tests indicate the 6 db points to be ± 75 kc with respect to the center frequency. In order to provide additional flexibility in choosing a clear channel, the output circuit is slug tuned and can be adjusted to any frequency in the 1400 - 1600 kc range. It is anticipated that this adjustment will be pre-set by the training facility, or the case officer, hence the control is not accessible from outside the case.

2.3. Battery Polarity

Since the converter employs transistors, the proper battery polarity must be observed. The decision as to the best polarity arrangement is complicated by the fact that the physical relation of the plus and minus poles of many mercury cells is the exact opposite of that used in standard flashlight cells. The above fact, the desirability of using a battery chamber externally accessible, and the level of training required by the operator have been considered in arriving at the present polarity arrangement. It is believed that familiarity with the use of standard cells in home and utility devices is likely to prompt the relatively untrained operator to insert the battery "nose first". This

supposition has been used as a guide in arranging the polarities with the result that the case of the unit is positive. The polarities are plainly marked at all connecting points.

III. OPERATION

3.1.

3.1.1.

3.1.2.

3.2.

3.2.1. The units are shipped peaked at 1500 kc. If the location of a clear broadcast channel is such as to require readjustment of the tuning slug to peak at another frequency in the 1400 - 1600 kc range, note that replacement of the case cover will de-tune the output circuit. This loss can be recovered by noting the output level at the peak with the cover off and then adjusting the slug into the coil until approximately the same reading is obtained with the cover in place. A slight change in circuit Q will prevent exact duplication of level readings but the difference will not be significant.

3.2.2. The on-off switch is actuated by the seating of the crystal case. When the unit is not in use, raise the crystal case until it is not in contact with the microswitch button. For long term storage remove the battery and/or the crystal.

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- 3.2.3. An antenna-ground terminal block is accessible through a slot in the case. The antenna connects to that terminal nearest the outer edge of the case. Note that the insulation of the antenna lead-in should remain intact until well beyond the recess opening in order to avoid grounding to the case. Hole clearances of the antenna-ground block are subject to wide tolerances, hence it may be necessary to double back the terminating end of a small lead-in, or ground wire, in order to maintain firm contact.
- 3.2.4. A permanently attached shielded cable is provided for connection to the broadcast receiver. It is anticipated that optimum operation will occur when the converter is used with a broadcast receiver that would normally employ an external antenna.
- 3.2.5. An adapter is supplied to permit the use of standard flashlight cells as a source of external power. This adapter is intended to indicate one possible means of providing external power. Another consideration might be to break away the glass envelope of a locally obtainable flashlight bulb and attach the adapter to the bulb base. Such an arrangement would then permit the use of the flashlight as power for the converter unit. Improvised means of obtaining external power need only to observe the polarity (case positive), and voltage rating (1.0 - 3.0 volts).
- 3.2.6. (It should be noted that a screw, which holds the top cover plate in place, has been located over the battery compartment. The use of a screw longer than those provided with the unit will tear the paper covering on the battery and result in jamming.) The present screw location is considered objectionable and it will be corrected in the nine units scheduled for January delivery.) The case of the above nine units will be $1/8''$ longer. If any further packaging of this unit is anticipated, plans should be based on a unit that has the dimensions: $3/4'' \times 1 \frac{13}{16}'' \times 3 \frac{1}{2}''$.
- 3.3. Specific Operating Instructions (Field Operator)
- 3.3.1. Connect antenna lead-in wire to that post on the converter antenna-ground terminal block nearest the outer edge of case. Leave sufficient insulation on this wire to prevent grounding against case. Connect ground wire to the other post.
- 3.3.2. Connect to the broadcast receiver the free end of the cable that is permanently attached to the converter. Connect the center wire to the broadcast receiver antenna terminal and the braid to ground.

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- 3.3.3. Insert the battery - negative terminal first. If external adapter is to be used, the center terminal of the adapter plug should be negative.
- 3.3.4. Insert the crystal, the frequency of which has been chosen in accordance with the instructions of paragraph 3.1.2. above. Press the crystal firmly into the socket as the seating of the crystal case turns the converter on.
- 3.3.5. Turn on the receiver and set the frequency dial to the broadcast channel to be used. Tune the receiver and the converter trimmer for maximum signal intensity.
- 3.3.6. To turn the converter off, raise the crystal case high enough to release microswitch in crystal socket.

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ENG-6074

Chief, Operations & Training Division, OC

19 January 1956

Chief, Engineering Division, OC

Transistorized Converter, CV-1

REF : Memorandum from OC-E to OC-O&T, X55-2434, dated 20 December 1955

1. The nine transistorized converter units scheduled for January delivery accompany this memorandum. We understand that the three sets of operating instructions forwarded with the first three units will satisfy the training requirement in this respect. It is pointed out, however, that additional sets of instructions and photographs can be made available, if required.

2. You are advised that recent bench checks on this converter unit have revealed that it is possible to extend the converter-to-receiver leads to a length where lead capacity will cause considerable detuning. This effect is especially noticeable when heavy shielded cable is used as an extension. Training activities should take note.

3. Sufficient mercury cells are not yet available to provide 100% spares for delivered units. Two spare batteries are enclosed; an additional ten will be forwarded immediately upon receipt.

Attachments:

Nine CV-1 Converters

Nine Power Adaptors

Nine Battery Holders

Two Spare Batteries

R&D/Lab/NCP/jcm (19 January 1956)

Distribution:

Original and 1 - Addressee

1 - R&D Lab ✓

1 - R&D Chrono

1 - OC-E Chrono

1 - Dev/s

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